ABSTRACT

Torque estimation techniques in the real-time basis for engine control and diagnostics applications using the measurement of crankshaft speed variation are disclosed. Two different torque estimation approaches are disclosed - *"Stochastic Analysis"* and *"Frequency Analysis."* An estimation model function consisting of three primary variables representing crankshaft dynamics such as crankshaft position, speed, and acceleration is used for each estimation approach. The torque estimation method are independent of the engine inputs (air, fuel, and spark). Both approaches have been analyzed and compared with respect to estimation accuracy and computational requirements, and feasibility for the real-time engine diagnostics and control applications. Results show that both methods permits estimations of the indicated torque based on the crankshaft speed measurement while providing not only accurate but also relatively fast estimations during the computation processes.